Research Notes

Program Steering Committee (PSC): Environmental

MONTH YEAR: May 2014

Title: Structural Acoustic Analysis of Piles: Pooled Fund TPF-5(140)

Task Number: 1010
Start Date: September 14, 2005
Completion Date: December 31, 2013

Product Category: Improved business practice procedure or process, and improved guidelines.

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This project investigated sound propagation related to pile driving in water and sediment.

WHAT IS THE NEED?

Bridges, ferry terminals, and other structures constructed over water commonly have driven pile foundations. Driving piles in water may produce intense underwater sound that can negatively impact aquatic animals. State DOTs, harbor districts and others must be able to reasonably predict the acoustical properties of sound generated by a project to forecast and mitigate the possible impacts to aquatic animals.

There is little scientific knowledge on noise characteristics produced in relation to variables in pile driving such as pile material, pile shape, hammer characteristics and so on. Understanding the acoustical properties of pile driving will help government and private entities select the proper materials and methods and noise reduction strategies for pile driving to economically ensure proper structural integrity while minimizing the adverse impacts of underwater noise.

WHAT ARE WE DOING?

A technical committee of representatives from participating entities identified common research needs, and selected items for funding. Specific research activities addressed within the program included: investigating how the characteristics of sound produced during pile-driving are influenced by modifications in pile materials, pile shape, hammer characteristics and other variables; investigating means to effectively reduce underwater sounds close to the piles during pile driving with attenuation systems; validating the predictive models during actual construction; and synthesizing information from this project with other

efforts notably NCHRP Project 25-28- Predicting and Mitigating Hydroacoustic Impacts on Fish from Pile Installation; and developing a guidance document for practitioners.

WHAT IS OUR GOAL?

The goal was to provide Caltrans and other government and private entities with information to be able to better select the proper materials and methods and noise reduction strategies for pile driving. Having this information helps to cost-effectively ensure proper structural integrity while minimizing the adverse impacts of underwater noise.

WHAT IS THE BENEFIT?

By being able to cost-effectively attenuate underwater noise from pile driving Caltrans can sustainably construct transportation facilities in sensitive aquatic habitats. This will help Caltrans meet its obligations under environmental law and regulations while expediting the timely construction of transportation projects. Negotiations with regulatory agencies on threatened and endangered species will be easier.

WHAT IS THE PROGRESS TO DATE?

The objectives of this pooled fund project have been fulfilled. Washington State DOT has published: Reinhall, Per G. and Peter H. Dahl. December 2011 An investigation of underwater sound propagation from pile driving. WA-RD 781.1 investigating how sound waves are created and propagate due to pile driving in aquatic environments.